

University of Nevada, Las Vegas Computer Science 477/677 Fall 2022

Assignment 6: Due Friday November 11, 2022, Midnight

Name: _____

You are permitted to work in groups, get help from others, read books, and use the internet. Please follow Mr. Wang's instructions on how to submit your completed assignment.

1. True or False.
 - (a) _____ Computers are so fast nowadays that there is no longer any need to be concerned about the time complexity of a program.
 - (b) _____ Computers have so much memory nowadays that there is no longer any need to be concerned about the space complexity of a program.
2. Your company sells boating accessories. You need to choose a hash function for your set of customer files. Which of the following would be a better hash function?
 - (a) The last four digits of the customer's social security number.
 - (b) the last four digits of the customer's zip code.

Why did you make that choice?

3. If separate chaining is used to resolve collisions in a hash table of size m which stores n items, the probability that a given place has exactly k items is approximately

$$\frac{(n/m)^k}{k! e^{n/m}}$$

as given by the Poisson distribution. If $m = 100$ and $n = 200$, the average number of items in a place is 2. Approximately how many places will have exactly 2 items? Choose from the following list.

- 100
- 55
- 45
- 27
- 21
- 13

4. You are trying to construct a cuckoo hash table of size 10, where each of the 9 names listed below has the two possible hash values, indicated in the array. Can you construct that table? Construct the table, or show that it can't be done by using Hall's marriage theorem.

	h1	h2
Ann	0	3
Bob	1	3
Ted	6	8
Sue	3	6
Gus	2	7
Cal	4	7
Dan	1	9
Sal	6	9
Eve	5	8

5. Suppose you wish to store the values $\binom{n}{k}$ for all $n \leq N$ for some constant N . Recall that $0 \leq k \leq n$. These values form a triangular array, shown below for $N = 6$. To save space, you will store the values in a 1-dimensional array $A[M]$, where M is the size of the triangle. For example, $M = 21$ if $N = 6$. Write a function to fetch values. Here is your function, with one missing formula.

```
int choose(int n, int k)
{
    int index =
    // fill in the formula for index
    return A[index];
}
```

Here is Pascal's triangle for $n \leq 6$.

```
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
```